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Illumination Design Data

for

Industrial and Commercial Interiors

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Preface

With the keener appreciation of the value of artificial illumination has come, quite naturally, a demand for lighting systems which will meet requirements far more exacting than those that earlier systems were expected to satisfy. Not only are more foot-candles of illumination required but refinement in illumination design has become necessary; considerations which were looked upon as relatively unimportant when lighting was judged by the old standards, have taken on a new significance; the selection and spacing of lighting units, the coefficient of utilization, depreciation of the system, and similar fundamental factors which influence the result must be handled with more careful attention to the conditions and requirements of the individual installation. To take the several essential factors properly into account, has appeared so complicated a task that many designers have adhered to rule-of-thumb methods which, while adequate in some cases, are likely to lead to unsatisfactory results when applied generally.

The method of design presented in this bulletin is known as the "lumen method" and will be found fully as simple as any of the common short-cuts. It has the decided advantage that the technical considerations which are important as influencing the result and which require the experienced judgment of the engineer, have been taken into account in the preparation of the charts and tables and therefore automatically receive due allowance in the lighting design. The data apply in interiors where standard types of reflecting equipment are used to obtain general lighting of substantially uniform intensity.

DEFINITIONS

SYSTEMS OF ILLUMINATION

General Overhead Lighting: A system of overhead light sources or luminaires usually symmetrically arranged to produce approximately uniform illumination throughout a room or area. If properly designed, this lighting enables equally good vision in any location or position as in well distributed daylight.

Group or Localized Overhead Lighting: A modification of general overhead lighting employing an arrangement of light sources placed with respect to machines, benches, or desks, to provide increased illumination or a preferred direction of light for the more important points in the room or area—sometimes termed localized general lighting.

Local Lighting: A system by which a single luminaire or lamp is depended upon to illuminate small areas, such as benches, desks or machines. The lamps are usually placed close to the work so that little, if any, general illumination of the room or area results. Local lighting is, therefore, rarely suitable, except as a supplement to general overhead lighting.

ILLUMINATION DESIGN TERMS

Lumen: The lumen is the unit of light flux quantity. The number of lumens required to light a given surface depends upon the desired illumination in foot-candles and upon the area of the surface in square feet. MAZDA lamps are rated in lumens.

Foot-Candle: The degree to which a surface is illuminated is measured in foot-candles. One lumen will light a surface of 1 square foot to an average intensity of 1 foot-candle.

Coefficient of Utilization: (Percentage of Lumens Effective): The proportion of the lumens generated by the lamps which reaches the plane of work is known as the Coefficient of Utilization. It is dependent upon the type of diffusing and reflecting equipment, color of walls and ceiling and also the proportions of the room, that is, the size and shape of the room and the height of the light source above the plane of work. These room proportions are classified in this bulletin by the **Room Index** table. The plane of work, unless otherwise specified, is ordinarily considered to be horizontal and 2½ feet above the floor.

Depreciation Factor: This represents a safety factor which provides added initial illumination sufficient to compensate for aging of the lamps and the falling off in reflecting efficiency of the reflectors, walls and ceilings due to deterioration and the collection of dust and dirt. A depreciation factor should always be applied to the recommendations for foot-candles of illumination since these are always stated in terms of average service, or sustained illumination.

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ILLUMINATION DESIGN DATA
for
Industrial and Commercial Interiors

The difference between good illumination which cheers the mind and comforts the senses, and poor lighting with its gloom and glare, obviously is nothing more than the difference in results as produced by modern equipment—reflectors and lamps—properly installed, and the results produced by mediocre equipment installed without regard or knowledge of principle and good practice. The data in this bulletin point out, first, the desirable standard of illumination for many classes of interiors, and then, by a few simple steps show how this standard illumination is obtained.

The Four Steps in the Design of a Lighting System

1. **Decide the foot-candle illumination required.**
   For recommended values refer to Table 1 ..... Pages 4–8

2. **Select the lighting unit best adapted to the location.**
   An analysis of criteria and ratings for typical units are given in Table 2 ..... Pages 9–12

3. **Determine the proper location of outlets.**
   The proper spacing of units with respect to their mounting height can be determined directly from Table 3 ..... Page 15

4. **Ascertain the size of MAZDA lamp necessary to provide the foot-candles desired.**

   A. Classify the interior by referring to Room Index Table 4 ..... Pages 18–19

   B. Find the Coefficient of Utilization of installation from Table 5 ..... Pages 20–21

   C. Select proper lamp size by referring to Table 6 Pages 22–23

   For purposes of calculation a table of lumen outputs of MAZDA lamps and a simple formula are given on Page 24.

Foot-Candle Illumination

Table 1, following, lists the foot-candle values, corresponding to present standards, for different classes of industrial operations, offices, stores, etc. The desirable illumination varies rather widely, depending on the conditions in any particular installation, such as the accuracy of the operation and fineness of detail to be observed, the color of goods worked on or handled and, in the case of stores, the advertising value resulting from the attractiveness of a well lighted interior. The foot-candle values recommended in the table are the minimum to be adhered to if fully satisfactory lighting is to be assured. Under particular conditions considerably higher illumination is often desirable.

TABLE No. 1

Present Standards of Foot-Candles Illumination for STORES, COMMERCIAL and PUBLIC INTERIORS

	Foot-Candles	
	Recommended	Under Some Conditions
Department Stores and Large Specialty Stores:		
Main Floors	10	6–12
Basement Store	10	6–12
Other Floors	8	5–10
Show Windows:		
Large Cities—		
Brightly Lighted District	100	50–150
Secondary Business Locations	50	25–75
Neighborhood Stores	25	10–50
Medium Cities—		
Brightly Lighted District	50	25–75
Neighborhood Stores	25	10–50
Small Cities and Towns	25	10–50
Lighting to Eliminate Daylight Window Reflections		200–1000
Stores of Medium Size:		
Clothing, Dry Goods, Furniture, Etc	8	5–10
Exclusive Small Stores:		
Light Goods	8	5–10
Dark Goods	12	8–16

	Foot-Candles	
	Recommended	Under Some Conditions
Small Stores:		
Art	8	5–10
Automobile Supply	6	4– 8
Bake Shop	6	4– 8
Book	6	4– 8
China	6	4– 8
Cigar	8	5–10
Clothing	8	5–10
Confectionery	8	5–10
Dairy Products	6	4– 8
Decorator	8	5–10
Drug	8	5–10
Dry Goods	8	5–10
Electrical Supply	8	5–10
Florist	6	4– 8
Furrier	8	5–10
Grocery	6	4– 8
Haberdashery	8	5–10
Hardware	6	4– 8
Hat	8	5–10
Jewelry	8	5–10
Leather, Handbags and Trunks	6	4– 8
Meat	8	4– 8
Millinery	8	5–10
Music	6	4– 8
Notions	6	4– 8
Piano	6	4– 8
Shoe	8	5–10
Sporting Goods	6	4– 8
Tailor	8	5–10
Tobacco	8	5–10
Variety Store	10	6–12

TABLE No. 1 (Continued)

Present Standards of Foot-Candles Illumination for STORES, COMMERCIAL and PUBLIC INTERIORS

	Foot-Candles	
	Recommended	Under Some Conditions
Armories, Public Halls	5	3– 6
Auditoriums	3	2– 4
Automobile Show Room	8	5–10
Bank:		
Lobby	6	4– 8
Cages and Offices	10	6–12
Barber Shop	8	5–10
Cars:		
Baggage	6	5–10
Daycoach, Dining, and Pullman	8	6–12
Mail—		
Bag Racks	8	6–12
Letter Cases	10	8–16
Storage	6	5–10
Street Railway, Subway	8	6–12
Churches:		
Auditorium	3	2– 4
Sunday School Room	5	3– 6
Club Rooms	4	3– 6
Dance Halls	4	3– 6
Dental Office:		
Waiting Room	4	3– 6
Office	15	10–20
Depot—Waiting	4	3– 6
Drafting Room	15	10–20
Elevators—Freight and Passenger	4	3– 6
Garage—Automobiles:		
Storage—Dead	2	1– 2
Live	6	4– 8
Repair Department and Washing	8	5–10
Gymnasiums:		
Main Exercising Floor	8	5–10
Swimming Pool	4	3– 6
Shower Rooms	4	3– 6
Locker Rooms	4	3– 6
Fencing, Boxing, Wrestling	8	5–10
Halls, Passageways in Interiors	2	1– 4
Hospitals:		
Lobby and Reception Room	4	3– 6
Corridors	3	2– 4
Wards and Private Rooms—		
With local illumination	3	2– 4
With no local illumination	6	4– 8
Night illumination	0.1	0.1–0.2
Operating Table	75	50–100
Operating Room	10	6–12
Laboratories	10	6–12
Hotels:		
Lobby	4	3– 6
Dining Room	5	4– 8
Kitchen	6	4– 8
Bedrooms	6	4– 8
Corridors	1	1– 2
Writing Room	8	5–10

	Foot-Candles	
	Recommended	Under Some Conditions
Indoor Recreations:		
Basketball and Indoor Baseball	10	6–12
Bowling (On Alley, Runway and Seats)	5	3– 6
(On Pins)	15	10–20
Billiards (General)	4	3– 6
(On Table)	15	10–20
Racquet, Handball, Squash and Indoor Tennis	15	10–20
Skating Rinks	5	4– 8
Library:		
Reading Rooms	8	5–10
Stack Room	4	3– 6
Lodge Rooms	4	3– 6
Lunch Room	8	5–10
Market	8	5–10
Moving Picture Theatre:		
During Intermission	3	2– 4
During Pictures	0.1	0.1–0.2
Museum (General)	5	4– 8
(On Walls)	8	5–10
Office Buildings:		
General Office	10	6–12
Private Offices	10	6–12
File Room	4	3– 6
Stenographer and Bookkeeping Rooms	10	6–12
Vault	4	3– 6
Restaurants	5	4– 8
Schools:		
Auditorium	3	2– 4
Class Rooms, Library and Office	10	6–12
Corridors and Stairways	3	2– 4
Drawing	15	10–20
Laboratories	10	6–12
Manual Training	10	6–12
Sewing Rooms	15	10–20
Study Room—		
Desks	10	6–12
Blackboards	6	4– 8
Studio:		
Art and Photographic	10	6–12
Portrait Photography — (Photographic Daylight)	...	50–200
Moving Picture—General	5	3– 6
Moving Picture—Sets (Photographic Daylight)	...	500–2000
Telephone:		
Manual Exchanges	5	3– 6
Automatic Exchanges	10	6–12
Theatres:		
Auditorium	3	2– 4
Foyer	5	3– 6
Lobby	8	5–10
Toilet and Washrooms	4	3– 6

TABLE No. 1 (Continued)

Present Standards of Foot-Candles Illumination for INDUSTRIAL INTERIORS

	Foot-Candles	
	Recommended	Under Some Conditions
Offices:		
Private, General	10	6–12
Drafting Room	15	10–20
Industrial:		
Aisles, Stairway, Passageways and Corridors	2	1– 2
Assembling—		
Rough	5	3– 6
Medium	8	5–10
Fine	10	8–16
Extra Fine	10–50	.....
Automobile Storage (See Garage)		
Bakeries	8	5–10
Boilers, Engine Rooms and Power Houses:		
Boilers, Coal and Ash Handling, Storage Battery Rooms	3	2– 4
Auxiliary Equipment, Oil Switches and Transformers	5	3– 6
Switch Boards, Engines, Generators, Blowers, Compressors	6	4– 8
Book Binding:		
Folding, Assembling, Pasting, etc	5	3– 6
Cutting, Punching, Stitching	8	5–10
Embossing	10	8–12
Candy Making	8	5–10
Canning and Preserving	8	5–10
Chemical Works:		
Hand Furnaces, Boiling Tanks, Stationary Driers, Stationary or Gravity Crystallizing	3	2– 4
Mechanical Furnaces, Generator and Stalls, Mechanical Driers, Evaporators, Filtration, Mechanical Crystallizing, Bleaching	4	3– 6
Tanks for Cooking, Extractors, Percolators, Nitrators, Electrolytic Cells	6	4– 8
Clay Products and Cements:		
Grinding, Filter Pressing, Kiln Rooms	3	2– 4
Molding, Pressing, Cleaning and Trimming	5	3– 6
Enamelling	6	4– 8
Coloring and Glazing	10	6–12

	Foot-Candles	
	Recommended	Under Some Conditions
Cloth Products:		
Cutting, Inspecting, Sewing—		
Light Goods	10	6–12
Dark Goods	20	10–50
Pressing, Cloth, Treating (Oil Cloth, etc.)—		
Light Goods	8	5–10
Dark Goods	12	8–16
Coal Breaking and Washing, Screening	3	2– 4
Construction—Indoor General	3	2– 4
Dairy Products	8	5–10
Electric Manufacturing:		
Storage Battery, Molding of Grids, Charging Room	6	4–8
Coil and Armature Winding, Mica Working, Insulating Processes	10	8–16
Elevator, Freight and Passenger	5	3– 6
Engraving	20	10–50
Forge Shops and Welding:		
Rough Forging	6	4– 8
Fine Forging and Welding	10	6–12
Foundries:		
Charging Floor, Tumbling, Cleaning, Pouring* and Shaking Out*	5	3– 6

*Since Pouring and Shaking Out are carried on in the same location as either Rough or Fine Molding, different illumination levels may be secured for these operations by cutting out some of the lighting circuits when space is used for the former.

Rough Molding and Core Making	6	4– 8
Fine Molding and Core Making	10	6–12
Glass Works:		
Mix and Furnace Rooms, Pressing and Lehr, Glass Blowing Machines	6	4– 8
Grinding, Cutting Glass to Size, Silvering	8	5–10
Fine Grinding, Polishing, Beveling, Inspection, Etching and Decorating	10	6–12
Glass Cutting (Cut Glass), Inspecting Fine	10–50	.....

TABLE No. 1 (Continued)

Present Standards of Foot-Candles Illumination for INDUSTRIAL INTERIORS

	Foot-Candles	
	Recommended	Under Some Conditions
Glove Manufacturing:		
Light Goods—		
Cutting, Pressing, Knitting	8	5–10
Sorting, Stitching, Trimming and Inspecting	10	8–16
Dark Goods—		
Cutting, Pressing, Knitting	10	6–12
Sorting, Stitching, Trimming and Inspecting	20	10–50
Hat Manufacturing:		
Dyeing, Stiffening, Braiding, Cleaning and Refining—		
Light	6	4– 8
Dark	10	6–12
Forming, Sizing, Pouncing, Flanging, Finishing, Ironing—		
Light	8	5–10
Dark	10	6–12
Sewing—		
Light	10	8–16
Dark	10–50	.....
Ice Making:		
Engine and Compressor Room	6	4– 8
Inspecting:		
Rough	6	4– 8
Medium	10	6–12
Fine	15	10–20
Extra Fine	10–50	.....
Jewelry and Watch Manufacturing	10–50	.....
Laundries and Dry Cleaning	8	5–10
Leather Manufacturing:		
Vats	3	2– 4
Cleaning, Tanning and Stretching	4	3– 6
Cutting, Fleshing and Stuffing	6	4– 8
Finishing and Scarfing	10	6–12
Leather Working:		
Pressing and Winding—		
Light	8	5–10
Dark	10	6–12
Grading, Matching, Cutting, Scarfing, Sewing—		
Light	10	8–16
Dark	10–50	.....
Locker Rooms	4	2– 4
Machine Shops:		
Rough Bench and Machine Work	6	4– 8
Medium Bench and Machine Work, Ordinary Automatic Machines, Rough Grinding, Medium Buffing and Polishing	10	6–12
Machine Shops: Contd.		
Fine Bench and Machine Work, Fine Automatic Machines, Medium Grinding, Fine Buffing and Polishing	12	8–16
Extra Fine Bench and Machine Work, Grinding (Fine Work)	10–50	.....
Meat Packing:		
Slaughtering	5	3– 6
Cleaning, Cutting, Cooking, Grinding, Canning, Packing	8	5–10
Milling and Grain Foods:		
Cleaning, Grinding or Rolling	5	3– 6
Baking or Roasting	8	5–10
Flour Grading	16	10–20
Packing:		
Crating	4	3– 6
Boxing	6	4– 8
Paint Manufacturing	6	4– 8
Paint Shops:		
Dipping, Spraying, Firing	5	3– 6
Rubbing, Ordinary Hand Painting and Finishing	8	5–10
Fine Hand Painting and Finishing	10	8–16
Extra Fine Hand Painting and Finishing (Automobile Bodies, Piano Cases, etc.)	15	10–50
Paper Box Manufacturing:		
Light	6	4– 8
Dark	8	5–10
Storage of Stock	3	2– 4
Paper Manufacturing:		
Beaters, Machine, Grinding	4	3– 6
Calendering	6	4– 8
Finishing, Cutting and Trimming	8	6–12
Plating	5	3– 6
Polishing and Burnishing	8	5–10
Printing Industries:		
Matrixing and Casting, Miscellaneous Machines, Presses	8	5–10
Proof Reading, Lithographing, Electrotyping	10	6–12
Linotype, Monotype, Typesetting, Imposing Stone, Engraving	10–50	.....
Receiving and Shipping	4	3– 6

TABLE No. 1 (Continued)

Present Standards of Foot-Candles Illumination for INDUSTRIAL INTERIORS

	Foot-Candles	
	Recommended	Under Some Conditions
Rubber Manufacturing and Products:		
Calenders, Compounding Mills, Fabric Preparation, Stock Cutting, Tubing Machines, Solid Tire Operations, Mechanical Goods Building, Vulcanizing	8	5–10
Bead Building, Pneumatic Tire Building and Finishing, Inner Tube Operation, Mechanical Goods Trimming, Treading	10	6–12
Sheet Metal Works:		
Miscellaneous Machines, Ordinary Bench Work	8	5–10
Punches, Presses, Shears, Stamps, Welders, Spinning, Fine Bench Work	10	8–16
Tin Plate Inspection	15	10–20
Shoe Manufacturing:		
Hand Turning, Miscellaneous Bench and Machine Work	8	5–10
Inspecting and Sorting Raw Material, Cutting, Lasting and Welting (Light)	10	6–12
Inspecting and Sorting Raw Material, Cutting, Stitching (Dark)	10–50	.....
Soap Manufacturing:		
Kettle Houses, Cutting, Soap Chip and Power	5	3– 6
Stamping, Wrapping and Packing, Filling and Packing Soap Powder	6	4– 8
Steel and Iron Mills, Bar, Sheet and Wire Products:		
Soaking Pits and Reheating Furnaces	2	1– 3
Charging and Casting Floors	4	3– 6
Muck and Heavy Rolling, Shearing, rough by gauge, Pickling and Cleaning	5	3– 6
Plate Inspection	15	10–20
Automatic Machines, Rod, Light and Cold Rolling, Wire Drawing, Shearing, fine by line	8	5–10
Stone Crushing and Screening:		
Belt Conveyor Tubes, Main Line Shafting Spaces, Chute Rooms, Inside of Bins	2	1– 2
Primary Breaker Room, Auxiliary Breakers under Bins	3	2– 4
Screen Rooms	5	3– 6
Store and Stock Rooms:		
Rough	3	2– 4
Medium	6	4– 8
Structural Steel Fabrication	6	4– 8
Sugar Grading	15	10–20
Telephone:		
Manual Exchanges	5	3– 6
Automatic Exchanges	10	6–12
Testing:		
Rough	5	3– 6
Fine	10	6–12
Extra Fine Instruments, Scales, etc	20	10–50
Textile Mills:		
(Cotton)—		
Opening and Lapping, Carding, Drawing, Frame Roving, Dyeing Spooling, Spinning, Drawing, in, Warping, Weaving, Quilling, Inspecting, Knitting, Slashing (Over beam end)	5	3– 6
	8	5–10
(Silk)—		
Winding, Throwing, Dyeing	12	8–16
Quilling, Warping, Weaving and Finishing—		
Light Goods	8	5–10
Dark Goods	10	8–16
(Woolen)—		
Carding, Picking, Washing and Combing	4	3– 6
Twisting and Dyeing	6	4– 8
Drawing in, Warping—		
Light Goods	6	4– 8
Dark Goods	10	8–16
Weaving—		
Light Goods	8	5–10
Dark Goods	12	10–20
Knitting Machine	10	6–12
Tobacco Products:		
Drying, Stripping, General	2	1– 3
Grading and Sorting	15	10–20
Upholstering:		
Automobile, Coach and Furniture	8	6–12
Toilet and Wash Rooms	4	3– 6
Warehouse	2	1– 2
Wood Working:		
Rough Sawing and Bench Work	5	3– 6
Sizing, Planing, Rough Sanding, Medium Machine and Bench Work, Gluing, Veeneering, Cooperage	8	5–10
Fine Bench and Machine Working, Fine Sanding and Finishing	8	6–12

Type of Lighting Unit

The selection of the type of lighting unit depends not only upon the requirements of the work, but in some cases upon the construction of the room and the color of the ceiling and walls. For example, semi- and totally indirect lighting is unsuited to rooms with very dark ceilings. Likewise it is important to specify the type of lamp to be used; in general, white bowl lamps should be used wherever open reflectors are installed at mounting heights less than 20 feet.

Other factors may enter into the choice of the lighting unit in certain instances, for example, in stores, offices and other public installations, decorative effect is often an important item.

Lighting Units Rated

Various lighting units are rated in accordance with seven fundamentals, illustrated on Page 12. The importance of these criteria is different for different classes of work. It must be emphasized that the relative importance of the various criteria should be carefully weighed with respect to the particular problem at hand. For instance, in an office the criteria of major importance would rank: (1) Direct glare; (2) Reflected glare; (3) Shadows. On the other hand, where lamps are to be hung above a crane in a foundry, the order of importance would be: (1) Efficiency based upon illumination on horizontal; (2) Vertical illumination; (3) Maintenance.

In the chart, Table 2, the best rating given is A+, which denotes the highest degree of excellence, while D, the lowest, indicates that an installation of units so rated in any particular, will very likely prove unsatisfactory in an installation where this factor is important. The ratings B and C, while indicating a result not equal to A, are decidedly superior to rating D. In other words, a rating B, C+, or C in certain respects does not disqualify a unit provided that in the essential requirements of a given location, the unit is rated A or B+.

A+	Excellent	B+	Good	C+	Fair	D	Very bad
A		B		C			
A−		B−		C−			

Note: It is important that good reflecting equipment be installed. The luminaires shown in these charts illustrate certain types. For example, No. 9 is a unit of a general type of which there are a great variety made by various manufacturers. Of two or more units of the same type the choice should be governed by considerations of brightness, diffusion, absorption, appearance, and cost, and not by cost alone. Of two samples of glass enclosing globes, outwardly identical, one may absorb 30% of the light and the other only 15% for the same degree of diffusion. The safest plan is to choose products of reliable manufacturers.

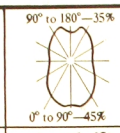
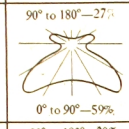
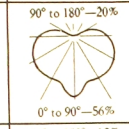
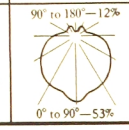
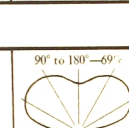
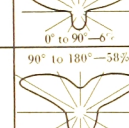
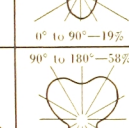
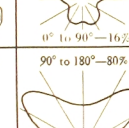
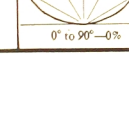
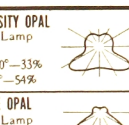
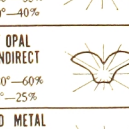
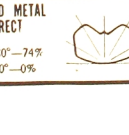
TABLE 2

A GUIDE TO THE SELECTION OF REFLECTING EQUIPMENT

	LIGHTING UNIT		EFFICIENCY BASED UPON ILLUMINATION ON HORIZONTAL	EFFICIENCY BASED UPON ILLUMINATION ON VERTICAL	APPEARANCE OF LIGHTED ROOM	DIRECT GLARE	REFLECTED GLARE	SHADOWS	MAINTENANCE
	DIRECT LIGHTING PORCELAIN ENAMEL REFLECTORS								
1	R L M DOME Clear Lamp	90° to 180°—0% 0° to 90°—76%	A+	B+	C+	C	D	C+	A+
			Use white-bowl lamps when mounted lower than 20 feet.						
2	R L M DOME White Bowl Lamp	90° to 180°—0% 0° to 90°—66%	A−	B	B	B+	B	B+	A−
			For general industrial lighting.						
3	GLASSTEEL DIFFUSER	90° to 180°—7% 0° to 90°—60%	B+	B	A−	A−	B+	A−	B+
			For best grade industrial lighting.						
4	PORCELAIN ENAMEL BOWL Clear Lamp	90° to 180°—0% 0° to 90°—65%	B+	B−	C	C+	D	C	A
			RLM Dome always more efficient.						
	DIRECT LIGHTING OPEN GLASS REFLECTORS								
5	DENSE OPAL GLASS Diffusing Bulb Lamp	90° to 180°—16% 0° to 90°—60%	B+	B−	A−	B+	B−	B	B
			For lamps of 100-watts and smaller.						
6	MIRRORED GLASS Clear Lamp	90° to 180°—0% 0° to 90°—68%	A	B	C	C+	D	C	A−
			Especially for large lamps in high bays.						
7	PRISMATIC INDUSTRIAL (DISTRIBUTIVE) Clear Lamp	90° to 180°—18% 0° to 90°—73%	A+	A−	B+	C+	D	C+	B−
			For relatively low mounting heights.						
8	PRISMATIC INDUSTRIAL (CONCENTRATED)	90° to 180°—19% 0° to 90°—70%	A+	B	B+	B−	D	C	B−
			For relatively high mounting.						
	BARE LAMP	90° to 180°—49% 0° to 90°—51%	B−	B	D	D	D	D	A+
			Gloom and glare.						
	LAMP CLUSTER	90° to 180°—0% 0° to 90°—82%	B	B	C	D	D	C+	A−
			Glare and inefficiency.						
	FLAT CONE Clear Lamp	90° to 180°—10% 0° to 90°—74%	B	C+	C	B	C+	C+	B+
			Glare and inefficiency.						
	FLAT CONE Shielding Band Clear Lamp	90° to 180°—1% 0° to 90°—54%	B	C+	C+	C+	D	C	B+
			Unit No. 2 and No. 3 generally preferable.						
	DEEP BOWL Bowl-Enameled Lamp	90° to 180°—0% 0° to 90°—58%	B	B	C	D	D	C	A+
			For local lighting — Use diffusing bulb.						

TABLE 2

A GUIDE TO THE SELECTION OF REFLECTING EQUIPMENT

	LIGHTING UNIT		EFFICIENCY BASED UPON ILLUMINATION ON HORIZONTAL	EFFICIENCY BASED UPON ILLUMINATION ON VERTICAL	APPEARANCE OF LIGHTED ROOM	DIRECT GLARE	REFLECTED GLARE	SHADOWS	MAINTENANCE
	DIRECT LIGHTING ENCLOSING AND SEMI-ENCLOSING UNITS								
9	WHITE GLASS ENCLOSING GLOBE Flattened	 90° to 180°—35% 0° to 90°—45%	B	B	A	B	B	A−	A−
			For store and general utility lighting.						
10	PRISMATIC ENCLOSING	 90° to 180°—27% 0° to 90°—59%	B+	B	A	B	B−	B+	B
			An efficient general utility unit.						
11	SEMI-ENCLOSING Metal Reflector	 90° to 180°—20% 0° to 90°—56%	B	B	A	B	B	B+	B−
			Ratings generally comparable with Unit No. 9						
12	TWO-PIECE GLASS Reflector and Bowl	 90° to 180°—12% 0° to 90°—53%	B	B	A	B+	B+	A−	B−
			Ratings generally comparable with Unit No. 9.						
	SEMI-INDIRECT AND INDIRECT LIGHTING UNITS								
13	SEMI-INDIRECT DENSE GLASS OR METAL AND DENSE GLASS	 90° to 180°—69% 0° to 90°—6%	C+	C	A	A+	A	A+	C
			For high grade office and commercial lighting.						
14	DUST-TIGHT SEMI-INDIRECT (PRISMATIC)	 90° to 180°—58% 0° to 90°—19%	B−	C+	A	A	A−	A−	B
			For high grade office and commercial lighting.						
15	DUST-TIGHT SEMI-INDIRECT (CLEAR TOP)	 90° to 180°—58% 0° to 90°—16%	C+	C	A	A	A	A	B
			Same use as Unit No. 14 — Use white-bowl lamps to keep brightness low.						
16	MIRRORED INDIRECT	 90° to 180°—80% 0° to 90°—0%	C+	C	B+	A+	A	A+	C
			For high grade office and commercial lighting.						
	LIGHT DENSITY OPAL Clear Lamp 90° to 180°—33% 0° to 90°—54%		B+	B	B+	C+	D	B−	B
			Units No. 5 or No. 9 preferable.						
	DENSE OPAL Clear Lamp 90° to 180°—15% 0° to 90°—67%		A+	B+	B+	B	D	C+	A−
			Use white-bowl lamp or Unit No. 5.						
	DIFFUSING GLOBE Light Opal 90° to 180°—35% 0° to 90°—40%		B−	B−	A	B−	B	B+	B+
			Unit No. 9 has higher efficiency.						
	LIGHT OPAL SEMI-INDIRECT 90° to 180°—60% 0° to 90°—25%		B−	C+	A	B+	B+	A−	C
			Too bright — Dense bowl preferable (Unit No. 13).						
	ENAMELED METAL INDIRECT 90° to 180°—74% 0° to 90°—0%		C	C	B+	A+	A	A+	C
			Somewhat less efficient than Unit No. 16.						

ILLUMINATION ON HORIZONTAL SURFACES is a prime requisite in offices, drafting rooms and those shops where the problem is to provide the best illumination for sustained vision of flat surfaces on the horizontal or slightly oblique planes in which papers, books and other flat objects are usually examined.

ILLUMINATION ON VERTICAL SURFACES of work or machine parts is fully as important as the lighting of the surface in the horizontal plane. In a consideration of the amount of light necessary for factory illumination, the criterion must be the intensity on all working surfaces whether vertical, horizontal or oblique.

FAVORABLE APPEARANCE OF LIGHTED ROOM refers only to the general or casual effect produced by the complete system, and is not intended to rate the unit as to satisfaction from the standpoint of good vision or freedom from eye fatigue.

DIRECT GLARE is the most frequent and serious cause of bad lighting. It results among other things from unshaded or inadequately shaded light sources located within the field of vision, or from too great contrast between the bright light source and a dark background or adjacent surfaces. Glare should be avoided by the use of proper reflecting and diffusing equipment.

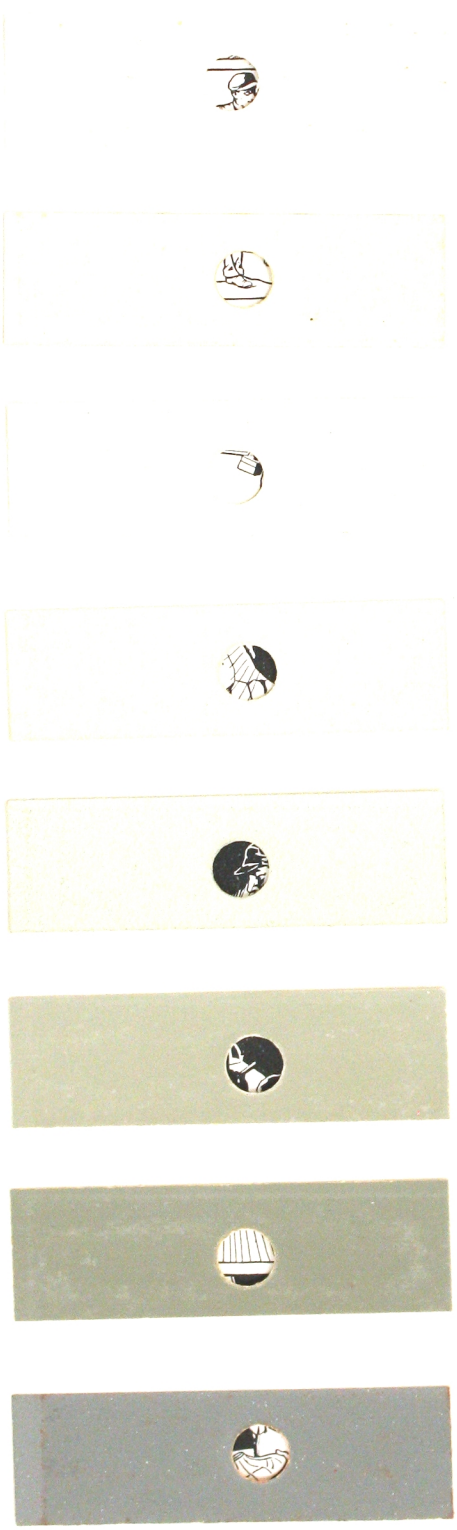
REFLECTED GLARE from polished working surfaces is particularly annoying because of the necessity of directing the eyes toward those surfaces, and further because the eyes are by nature especially sensitive to light rays from below. The harmful effects of this specular reflection can be minimized by properly shielding from below or diffusing the source.

SHADOWS, that is, differences in brightness of surfaces, are essential in observing objects in their three dimensions, but are of little or no value in the observation of flat surfaces. Where shadows are desirable, they should be soft and luminous, not so sharp and dense as to confuse the object with its shadow.

MAINTENANCE depends upon contour of reflector, construction of fixture, and condition of ceiling. The rating is based upon the likelihood of breakage, the labor involved in maintaining the units at comparable degrees of efficiency, and indication given of need of cleaning.

Reflection Factors

The proportion of light reflected by walls and ceilings of various colors, that is, their Reflection Factors, has an important bearing on both the natural and the artificial lighting. The proportion reflected will depend somewhat upon the color of the incident light. The figures here given show what proportion of



No. 1 White Paper 81%

No. 2 Gray 67%

No. 3 Gray 62%

No. 4 Gray 54%

No. 5 Gray 44%

No. 6 French Gray 37%

No. 7 Gray 28%

No. 8 Gray 21%

No. 9 Ivory White 79%

No. 10 Caen Stone 70%

No. 11 Ivory 75%

No. 12 Ivory Tan 64%

No. 13 Primrose 74%

No. 14 Lichen Gray 69%

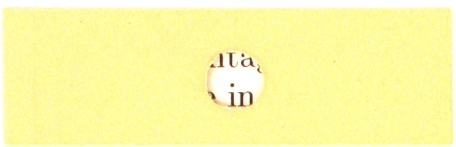
No. 15 Pearl Gray 73%

No. 16 Silver Gray and Caen Stone 50%

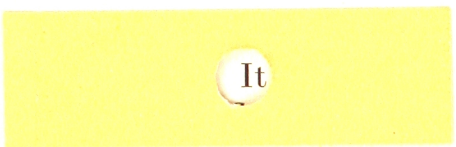
# of Colored Surfaces

the light of MAZDA lamps these painted surfaces reflect. Reflection Factors are of special usefulness in determining the Coefficient of Utilization (ratio of light delivered at the work to total light of lamps) applicable to an interior. The Reflection Factor of any colored surface can be approximated by comparing it with these samples.

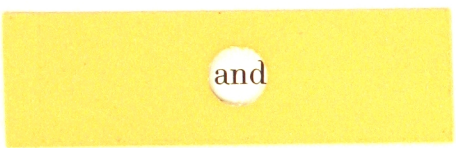
No. 17
Buff Stone and Pale Azure
49%



No. 18
Buff
65%



No. 19
Buff Stone
55%



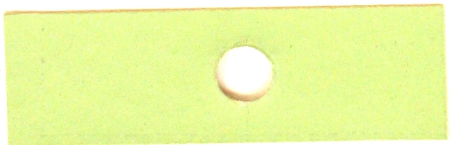
No. 20
Tan
32%

No. 21
Cocoanut Brown
16%

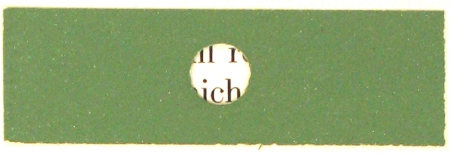
No. 22
Satin Green
62%

No. 23
Bright Sage and Ivory Tan
48%

No. 24
Bright Sage
40%



No. 25
Forest Green
18%



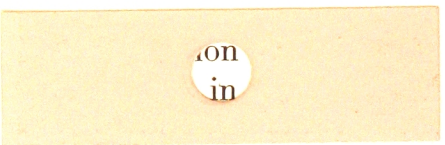
No. 26
Olive Green
22%

No. 27
Pale Azure and White
52%

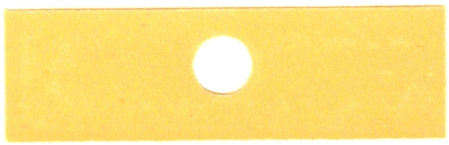
No. 28
Pale Azure
43%

No. 29
Sky Blue
35%

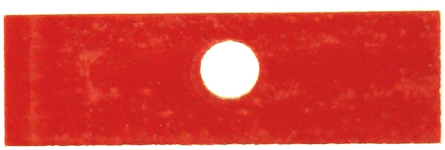
No. 30
Shell Pink
58%



No. 31
Pink
56%



No. 32
Cardinal Red
18%



Influence of Interior Finish on Illumination Result

The interior finish of a building, that is, the color of the ceiling, ceiling beams, sidewalls, columns, etc., has a considerable influence upon the illumination result. The accompanying Color Chart shows the percentage of light which the various colors will reflect. These values are in turn taken into account in Table 5 which gives the Coefficients of Utilization for several conditions of interior finish.

Certain types of reflectors, due to their contour and quality of materials, will direct light more efficiently to the area to be lighted than will others. It will be seen from Table 5 that, with open type enameled steel reflectors such as the RLM Dome, the influence of the color of walls and ceiling is at a minimum; the effect of this factor becomes of increasing importance as open glass reflectors, enclosing light-directing and simple diffusing luminaires, are considered in turn, and with semi-indirect and indirect types the color of walls and ceiling is of major importance.

It is obvious that where the reflection factor of the ceiling and walls is high, a greater proportion of the light which strikes these surfaces will be reflected to the working area than where the interior is finished in dark colors. Where goods or materials are stored on shelves or close to the walls, as is the case in many stores and industrial interiors, the color of such materials will alter the illumination result. In buildings having large window areas, or in offices having glass partitions, the walls should be considered dark since the light which strikes these glass parts is transmitted through the glass and very little is reflected to the working area. The average reflection from side walls in any interior rarely exceeds 50 per cent, allowing, of course, for the proportion of wall area usually occupied by windows and doors. The reflection from ceilings, however, may be as high as 70 per cent and in some instances even higher.

Location of Outlets, Mounting Height and Number of Lighting Units

The cost of a lighting installation is largely made up of wiring costs, therefore it is imperative that the wiring be adequate for both present and possible future needs; when once the outlets are properly installed as regards both spacing and size of wire, a change in type of reflector, or in size of lamp may be made without undue complication, but where the spacing of outlets is too great or the wiring is inadequate, satisfactory results can never be obtained without considerable alteration.

Table 3 gives the spacing and mounting height for both direct and indirect units to provide uniform illumination. The procedure in using this table is to determine the greatest possible mounting height above the plane of work and find the spacing between units corresponding to this mounting height,* and then spot the outlets on an actual diagram or blueprint of the floor area. Locate the units as nearly symmetrically as possible without exceeding the permissible spacing.

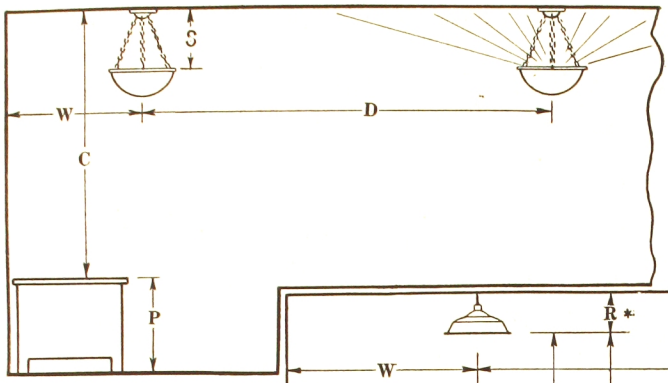
Units may be spaced at any distance less than the given permissible spacing, and, in fact, this is often desirable from the standpoint of soft shadows, appearance, and arrangement of the work. For example, if the permissible spacing is found to be 15 feet and the room is 20 feet square, one unit in the center of the room would not be satisfactory, and some symmetrical arrangement, such as 4 units (10-foot spacing) would be employed, The same holds true in large interiors which may be divided by posts into 20-foot spaces or bays.

In narrow interiors, such as small stores, it is often best to use two rows of units even though the permissible spacing distance may indicate one row allowable. Similarly in small rooms, offices, etc., one unit would hardly be recommended since all the light would come predominantly from one direction, with the likelihood of harsh shadows, and inconvenience in case of a lamp failure.

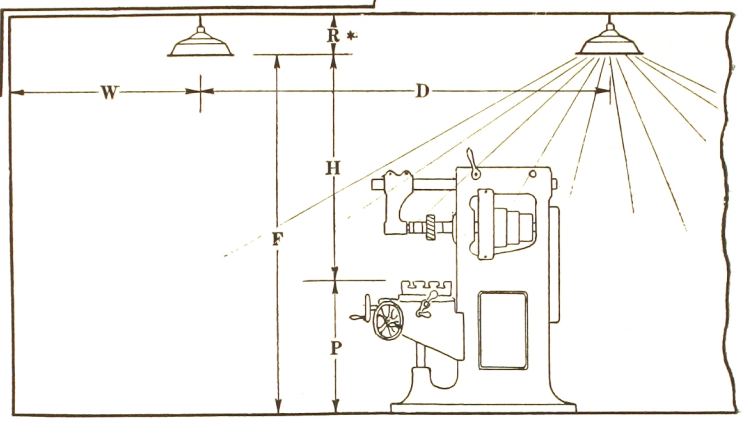
After the outlets have been carefully spotted, determine the *area per outlet* by dividing the total floor area by the number of units employed.

* Note: With indirect units use the distance from work plane to ceiling; see sketch.

TABLE No. 3—SPACING MOUNTING HEIGHT



Semi-Indirect and Indirect Lighting Units Nos. 13-16



Direct Lighting Units Nos. 1-12

*Minimum allowance for (R) usually 1 foot.

Direct Lighting Units Nos. 1-12		Semi- and Totally Indirect Lighting Units Nos. 13-16			Permissible Distance Between Outlets and Sidewalls	
Height of Unit Above Plane of Work (Feet) H	Permissible Distance Between Outlets (Feet) D	Ceiling Height Above Plane of Work (Feet) C	Permissible Distance Between Outlets (Feet) D	Suspension Distance Ceiling to Top of Reflector (Feet) S	In Usual Locations Where Aisles and Storage are Next to Wall (Feet) W	In Offices or Where Work Benches are Next to Wall (Feet) W
5	7½	5	7½	1¼	3½	2½
6	9	6	9	1½	4½	3
7	10½	7	10½	1¾	5	3½
8	12	8	12	2	6	4
9	13½	9	13½	2¼	6½	4½
10	15	10	15	2½	7½	5
11	16½	11	16½	2¾	8	5½
12	18	12	18	3	9	6
13	19½	13	19½	3¼	9½	6½
14	21	14	21	3½	10½	7
15	22½	15	22½	3¾	11	7½
16	24	16	24	4	12	8
18	27	18	27	4½	13½	9
20	30	20	30	5	15	10
22	33	22	33	5½	16½	11
24	36	24	36	6	18	12
27	40½	27	40½	6¾	20	13½
30	45	30	45	7½	22½	15
35	52½	35	52½	8¾	26	17½
40	60	40	60	10	30	20

Remember: In general, to get uniform illumination, units should not be spaced more than 1½ times the mounting height. Unit No. 7 will produce uniform illumination when spaced twice the mounting height, but because of resulting shadows this wider spacing is not recommended. Unit No. 8 on the other hand, because of its concentrated light distribution, requires a spacing no greater than the mounting height.

Size of Lamp Required

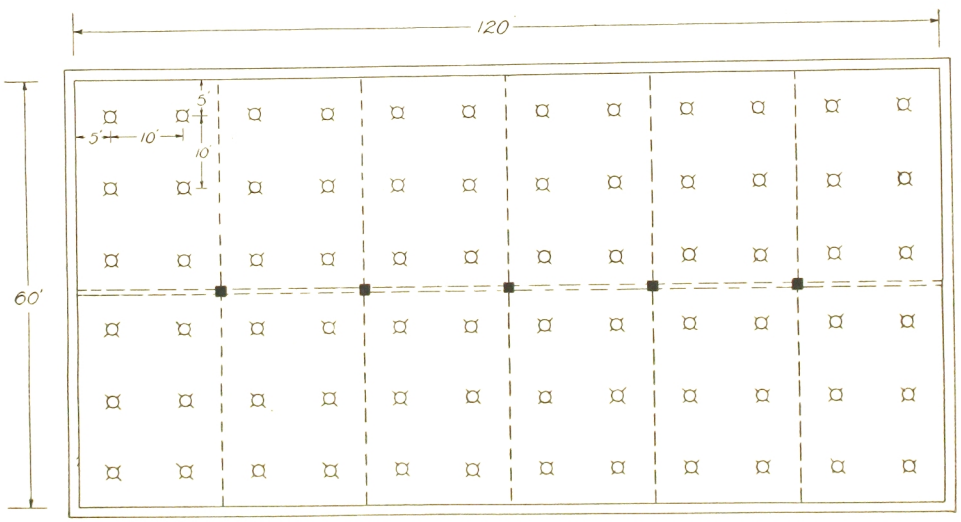
It will be noted that, in determining the proper location of outlets from the previous table, no mention was made of the size of lamp required; if it were not for the fact that provision for adequate wiring, and the selection of the luminaire of proper size, depends upon the size of lamp to be used, any general lighting system could be planned and installed without regard to the lamp size. However, since these factors, particularly adequate wiring, are so important, it is necessary to ascertain in advance the size of lamp required to furnish the desired foot-candle level of illumination.

It is indeed shortsighted to specify wiring that is not adequate to permit the use of the next larger size lamp to provide for higher standards of illumination that may be desired in the future.

As has been stated, in designing a lighting system, draw a plan of the area to be lighted, and show the location of outlets in a manner similar to the sketch below. *Determine the area in square feet per outlet.*

The prime consideration is to determine the percentage of light that actually gets down and is useful on the working plane. This percentage is affected by:

1. The room size and its proportions with regard to height of the units;



¤ Outlet for 1-150 watt bowl enameled MAZDA C lamp, equipped with an RLM Standard Dome Reflector, with suitable holder. Reflector located 11 feet above the floor

2. The color of walls and ceiling;

3. The character of the reflector used;

4. Depreciation due to dust and dirt.

After the outlets have been located on the plan, the size of lamp which will be required to furnish the desired foot-candles can be determined by reference in turn to the tables which follow. These tables take into account all of the items mentioned above.

Table 4—Room Index. This classifies the room according to its proportions. From this table find the Room Index corresponding most nearly to the dimensions of the installation. Apply this in the use of Table 5.

Table 5—Coefficient of Utilization. This is the proportion of the generated light from the lamps which reaches the plane of work. The Coefficient of Utilization for the installation of the type of lighting unit selected will be found in the proper column of wall and ceiling color opposite the correct Room Index.

Table 6—Computed Illumination Values. This table shows the foot-candles obtained with various sizes of lamps depending on the area per lamp and the Coefficient of Utilization for any given installation. A depreciation factor of 1.4 or approximately 30% has been allowed.

Having determined the area per outlet and the Coefficient of Utilization for any installation, the foot-candles resulting from the use of any size of lamp can be obtained directly from this table. The lamp used should produce approximately the number of foot-candles decided upon from Table 1 as desirable.

Calculating Illumination Results

The foot-candle values given in Table 6 have been computed for a wide variety of conditions purely for convenience. For other conditions such as the use of lamps of other lumen ratings, to provide for greater or less depreciation, or, in fact, for all cases not provided for in Table 6, the foot-candles can easily be computed from the formula

$$\text{Foot-candles} = \frac{\text{Coefficient of Utilization} \times \text{Lumens of Lamp}}{\text{Area per Outlet} \times \text{Depreciation Factor}^*}$$

Table 7, Page 24 gives the lumen output of the various sizes and types of multiple MAZDA lamps.

*Note—Use 1.3 for fairly clean location; 1.4 for average, and 1.5 for dirty locations or where cleaning is infrequent.

TABLE 4—ROOM INDEX

Classify the room according to the proportions and the mounting height above the plane of work. Use upper column headings for direct-lighting units;

Room Width	Room Length	DIRECT LIGHTING UNITS—Height Above Plane of Work — Feet													
Feet	Feet	4	5	6	7	8	9	10	12	14	16	20	24	30	40
8	10	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...	...	...	...
	12	1.25	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...	...
	14	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...	...
	16	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...	...
	18	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...
	20	1.5	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...
	24	1.5	1.25	1.0	0.8	0.6	0.6	0.6	0.6	0.6	...	...	...	...	...
	30	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...
	35	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...
	40	2.0	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...
	50	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
10	10	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...	...
	12	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...	...	...
	14	1.5	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...
	16	1.5	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...	...
	18	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...	...
	20	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...	...
	24	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...
	30	2.0	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	0.6	...	...	...	...
	35	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	40	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...
	50	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...
	60	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...
	70	2.0	1.5	1.5	1.25	1.25	1.0	1.0	0.8	0.8	0.6	0.6	...	...	...
12	12	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...	...
	14	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...	...
	16	1.5	1.25	1.0	0.8	0.8	0.8	0.6	0.6	...	...	...	...	...	...
	18	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...
	20	1.5	1.5	1.25	1.0	0.8	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	24	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	30	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...	...
	35	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...
	40	2.0	2.0	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...	...
	50	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...
	60	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...
	70	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...
	80	2.0	2.0	1.5	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	100	2.0	2.0	1.5	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...
14	14	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...	...
	16	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	...	...	...	...	...
	18	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	20	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	24	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...	...
	30	2.0	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	...	...	...	...
	35	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...
	40	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	0.6	...	...
	50	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...
	60	2.5	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	...	...
	70	2.5	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	80	2.5	2.0	2.0	1.5	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	100	2.5	2.0	2.0	1.5	1.5	1.5	1.5	1.25	0.8	0.8	0.6	0.6	...	...
16	16	2.0	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...	...	...
	18	2.0	1.5	1.25	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...	...
	20	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	...	...	...	...
	24	2.5	2.0	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...	...	...
	30	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...
	35	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...	...
	40	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...	...
	50	2.5	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	0.6	...
	60	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...
	70	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	...
	80	2.5	2.0	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6	...
	100	2.5	2.0	2.0	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
18	18	2.0	2.0	1.5	1.25	1.0	1.0	0.8	0.8	0.6	0.6	...	...	...	...
	20	2.5	2.0	1.5	1.25	1.25	1.0	1.0	0.8	0.6	0.6	...	...	...	...
	24	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...
	30	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...	...
	35	3.0	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...
	40	3.0	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	...	...
	50	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	0.6	...
	60	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...
	70	3.0	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6	...
	80	3.0	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	...
	100	3.0	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
	120	3.0	2.5	2.0	2.0	2.0	1.5	1.5	1.5	1.25	1.0	0.8	0.8	0.6	...
		6	7½	9	10½	12	13½	15	18	21	24	30	36	45	60
		SEMI- AND INDIRECT LIGHTING UNITS—Ceiling Height Above Plane of Work — Feet													

TABLE 4—ROOM INDEX

for semi-indirect and totally indirect units choose column at bottom of page. Wherever the circumstances are such that the room index falls between two given figures, interpolate or use the smaller number.

Room Width	Room Length	DIRECT LIGHTING UNITS—Height Above Plane of Work — Feet													
Feet	Feet	4	5	6	7	8	9	10	12	14	16	20	24	30	40
	20	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	0.6	...	...	...
	24	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...	...
	30	3.0	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6	...	...
	35	3.0	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	40	3.0	2.5	2.0	2.0	1.5	1.5	1.5	1.0	0.8	0.8	0.6	0.6	...	...
20	50	3.0	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6	...
	60	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6	...
	70	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
	80	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.25	1.25	1.0	0.8	0.6	0.6	0.6
	100	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6
	120	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6
	140	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6
	24	3.0	2.5	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	30	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	...	...
	35	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.25	1.0	0.8	0.6	0.6	...	...
	40	3.0	3.0	2.5	2.0	1.5	1.5	1.5	1.25	1.0	0.8	0.8	0.6	0.6	...
	50	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
24	60	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	...
	70	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6	0.6
	80	3.0	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.25	1.25	0.8	0.6	0.6	0.6
	100	3.0	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	120	3.0	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	140	3.0	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6
	30	4.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
	35	4.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	0.6	...
	40	4.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	...
	50	4.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	1.0	1.0	0.8	0.6	...
30	60	4.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.25	1.0	0.8	0.6	0.6
	70	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	80	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	100	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.0	0.8	0.6	0.6
	120	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6
	140	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	35	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6	...
	40	5.0	4.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.25	0.8	0.8	0.6	...
	50	5.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	60	5.0	4.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
35	70	5.0	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.0	0.8	0.6	0.6
	80	5.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	1.0	0.8	9.6
	100	5.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	120	5.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	140	5.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.25	0.8	0.6
	40	5.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.8	0.6	0.6
	50	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5	1.5	1.25	1.0	0.8	0.8	0.6
	60	5.0	4.0	4.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	1.0	0.8	0.6
40	70	5.0	4.0	4.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	1.0	0.8	0.6
	80	5.0	4.0	4.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	100	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.5	1.25	1.0	0.6
	120	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.6
	140	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.8
	50	5.0	5.0	4.0	4.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	60	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.25	1.0	0.8	0.6
	70	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	1.5	1.5	1.25	1.0	0.6
	80	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.25	1.0	0.8
	100	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	1.5	1.25	1.0	0.8
50	120	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	1.5	1.5	1.25	0.8
	140	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	0.8
	170	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	0.8
	200	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.25	1.0
	60	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.25	1.0	0.8
	70	5.0	5.0	5.0	5.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5	1.25	1.0	0.8
	80	5.0	5.0	5.0	5.0	4.0	4.0	3.0	2.5	2.5	2.0	1.5	1.5	1.0	0.8
60	100	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5	1.5	1.25	1.0
	120	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.5	2.0	1.5	1.25	1.0
	140	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	1.5	1.25	1.0
	170	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	1.5	1.5	1.0
	200	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	3.0	2.5	2.0	2.0	1.5	1.0
	80	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5	1.25	1.0
80	140	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5	1.25
	200	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	2.0	1.5
	100	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	2.5	2.0	1.5	1.25
100	150	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5
	200	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	3.0	2.5	2.0	1.5
	120	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	2.5	2.0	1.5
120	160	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	3.0	2.5	2.0	1.5
	200	5.0	5.0	5.0	5.0	5.0	5.0	5 0	5.0	5.0	4.0	3.0	3.0	2.5	1.5
		6	7½	9	10½	12	13½	15	18	21	24	30	36	45	60
		Feet — SEMI- AND INDIRECT LIGHTING UNITS—Ceiling Height Above Plane of Work													

TABLE 5—COEFFICIENTS OF UTILIZATION

Find *Room Index* from Table 4. Check Reflection Factors on Color Chart

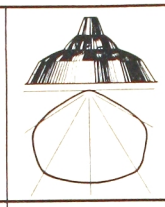
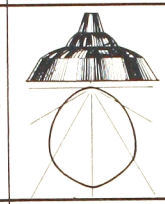
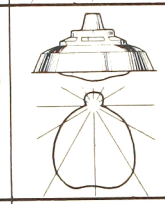
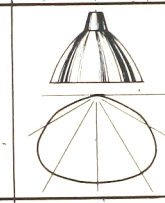
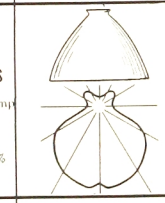
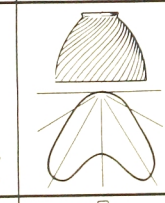
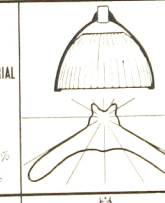
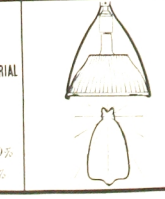
REFLECTOR TYPE		COLOR REFLECTION FACTOR: CEILING	VERY LIGHT (70%)			FAIRLY LIGHT (50%)			FAIRLY DARK (30%)	
		WALLS	FAIRLY LIGHT (50%)	FAIRLY DARK (30%)	VERY DARK (10%)	FAIRLY LIGHT (50%)	FAIRLY DARK (30%)	VERY DARK (10%)	FAIRLY DARK (30%)	VERY DARK (10%)
		ROOM INDEX	COEFFICIENTS OF UTILIZATION							
1 R L M DOME Clear Lamp 90° to 180°—0% 0° to 90°—76%		0.6	.34	.29	.24	.34	.29	.24	.28	.24
		0.8	.42	.38	.34	.42	.37	.33	.37	.33
		1.0	.46	.43	.39	.45	.42	.39	.42	.39
		1.25	.50	.47	.43	.49	.46	.43	.45	.42
		1.5	.53	.50	.46	.52	.49	.46	.48	.45
		2.0	.58	.55	.51	.57	.54	.51	.53	.51
		2.5	.62	.59	.56	.61	.58	.56	.58	.56
		3.0	.64	.61	.58	.63	.60	.58	.60	.58
		4.0	.67	.65	.63	.66	.64	.62	.63	.61
		5.0	.69	.67	.65	.67	.66	.64	.65	.63
2 R L M DOME White Bowl Lamp 90° to 180°—0% 0° to 90°—66%		0.6	.32	.28	.25	.32	.28	.25	.27	.25
		0.8	.40	.36	.34	.39	.35	.33	.35	.33
		1.0	.43	.39	.37	.42	.39	.37	.39	.37
		1.25	.46	.43	.41	.45	.43	.41	.43	.41
		1.5	.48	.45	.43	.47	.45	.43	.45	.43
		2.0	.52	.50	.48	.51	.49	.47	.49	.47
		2.5	.56	.54	.52	.55	.53	.51	.53	.51
		3.0	.57	.55	.53	.56	.54	.52	.54	.52
		4.0	.60	.58	.56	.59	.57	.55	.57	.55
		5.0	.61	.59	.57	.60	.58	.57	.58	.56
3 GLASSTEEL DIFFUSER 90° to 180°—7% 0° to 90°—60%		0.6	.29	.25	.21	.28	.24	.21	.23	.21
		0.8	.36	.32	.29	.35	.31	.28	.31	.28
		1.0	.39	.36	.33	.38	.35	.33	.34	.32
		1.25	.42	.39	.36	.41	.38	.36	.37	.35
		1.5	.45	.42	.39	.43	.40	.38	.39	.38
		2.0	.49	.46	.43	.48	.45	.43	.44	.42
		2.5	.53	.50	.47	.51	.49	.47	.47	.46
		3.0	.54	.52	.49	.52	.50	.49	.49	.47
		4.0	.57	.55	.53	.55	.53	.51	.51	.50
		5.0	.58	.56	.54	.56	.54	.53	.52	.51
4 PORCELAIN ENAMEL BOWL Clear Lamp 90° to 180°—0% 0° to 90°—65%		0.6	.31	.26	.23	.30	.26	.23	.25	.23
		0.8	.38	.34	.31	.37	.34	.31	.33	.31
		1.0	.41	.38	.35	.41	.38	.35	.37	.35
		1.25	.44	.41	.38	.44	.41	.38	.40	.38
		1.5	.47	.44	.41	.46	.43	.41	.43	.41
		2.0	.51	.48	.45	.50	.47	.45	.47	.45
		2.5	.54	.51	.49	.53	.51	.49	.51	.49
		3.0	.56	.54	.51	.55	.53	.51	.53	.51
		4.0	.58	.56	.54	.57	.55	.54	.55	.53
		5.0	.60	.58	.56	.58	.57	.55	.56	.55
5 DENSE OPAL GLASS Diffusing Bulb Lamp 90° to 180°—16% 0° to 90°—60%		0.6	.29	.24	.20	.28	.23	.20	.22	.20
		0.8	.35	.31	.28	.34	.30	.27	.29	.27
		1.0	.39	.35	.32	.38	.34	.32	.33	.31
		1.25	.43	.39	.36	.41	.38	.35	.36	.34
		1.5	.46	.42	.38	.44	.40	.37	.38	.36
		2.0	.51	.47	.44	.48	.45	.42	.43	.41
		2.5	.55	.51	.48	.52	.49	.46	.47	.45
		3.0	.57	.54	.50	.54	.51	.48	.48	.46
		4.0	.60	.57	.54	.57	.54	.52	.51	.50
		5.0	.62	.59	.56	.58	.56	.54	.53	.52
6 MIRRORED GLASS Clear Lamp 90° to 180°—0% 0° to 90°—68%		0.6	.32	.27	.24	.31	.27	.24	.27	.24
		0.8	.39	.35	.32	.39	.35	.32	.35	.32
		1.0	.43	.39	.37	.42	.39	.37	.39	.37
		1.25	.46	.43	.40	.46	.43	.40	.42	.40
		1.5	.49	.46	.43	.48	.45	.43	.45	.43
		2.0	.53	.50	.48	.52	.50	.48	.49	.48
		2.5	.57	.54	.52	.56	.54	.52	.53	.52
		3.0	.58	.56	.54	.57	.55	.54	.54	.53
		4.0	.61	.59	.57	.60	.58	.56	.57	.56
		5.0	.63	.61	.58	.61	.59	.58	.58	.57
7 PRISMATIC INDUSTRIAL (DISTRIBUTIVE) Clear Lamp 90° to 180°—18% 0° to 90°—73%		0.6	.33	.26	.21	.31	.25	.21	.24	.20
		0.8	.41	.35	.30	.39	.33	.29	.32	.29
		1.0	.45	.40	.35	.43	.39	.34	.37	.33
		1.25	.50	.44	.39	.47	.42	.38	.40	.37
		1.5	.52	.48	.43	.50	.45	.42	.43	.40
		2.0	.58	.54	.49	.56	.51	.47	.49	.46
		2.5	.63	.59	.54	.60	.56	.53	.54	.51
		3.0	.66	.62	.58	.63	.59	.56	.56	.54
		4.0	.71	.67	.63	.67	.63	.61	.60	.58
		5.0	.73	.69	.66	.69	.65	.63	.62	.60
8 PRISMATIC INDUSTRIAL (CONCENTRATED) Clear Lamp 90° to 180°—19% 0° to 90°—70%		0.6	.36	.31	.27	.34	.30	.27	.28	.26
		0.8	.44	.39	.36	.42	.38	.35	.37	.34
		1.0	.48	.44	.41	.46	.43	.40	.41	.39
		1.25	.53	.48	.45	.50	.47	.44	.44	.43
		1.5	.56	.52	.48	.53	.50	.47	.47	.45
		2.0	.61	.57	.52	.58	.55	.52	.52	.50
		2.5	.65	.61	.58	.62	.59	.56	.56	.55
		3.0	.68	.64	.60	.64	.61	.58	.58	.56
		4.0	.71	.68	.65	.67	.64	.62	.61	.60
		5.0	.73	.70	.66	.69	.66	.63	.63	.61

TABLE 5—COEFFICIENTS OF UTILIZATION

Find *Room Index* from Table 4. Check Reflection Factors on Color Chart

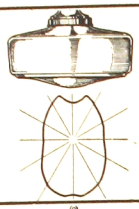
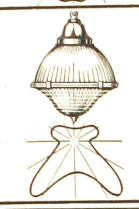
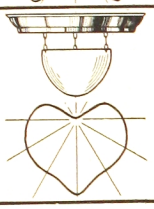
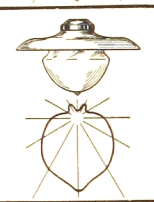
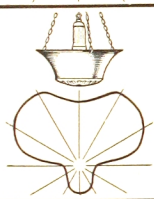
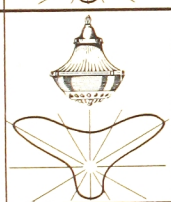
REFLECTOR TYPE		COLOR REFLECTION FACTOR: CEILING	COLOR REFLECTION FACTOR: WALLS	ROOM INDEX	VERY LIGHT (70%)			FAIRLY LIGHT (50%)			FAIRLY DARK (30%)	
					FAIRLY LIGHT (50%)	FAIRLY DARK (30%)	VERY DARK (10%)	FAIRLY LIGHT (50%)	FAIRLY DARK (30%)	VERY DARK (10%)	FAIRLY DARK (30%)	VERY DARK (10%)
					COEFFICIENTS OF UTILIZATION							
9 WHITE GLASS ENCLOSING GLOBE Flattened 90° to 180°—35% 0° to 90°—45%				0.6	.22	.17	.14	.20	.16	.13	.14	.12
				0.8	.27	.22	.19	.25	.21	.18	.19	.17
				1.0	.31	.26	.23	.28	.24	.21	.22	.19
				1.25	.35	.30	.26	.31	.27	.24	.25	.22
				1.5	.38	.33	.29	.34	.30	.27	.27	.24
				2.0	.42	.38	.33	.38	.34	.31	.31	.28
				2.5	.46	.41	.37	.41	.37	.34	.34	.31
				3.0	.49	.45	.40	.43	.39	.36	.36	.33
				4.0	.53	.48	.44	.47	.43	.40	.38	.36
				5.0	.55	.51	.47	.49	.45	.42	.40	.38
10 PRISMATIC ENCLOSING DIRECT 90° to 180°—27% 0° to 90°—59%				0.6	.28	.22	.18	.26	.21	.17	.19	.16
				0.8	.35	.29	.25	.33	.28	.24	.26	.23
				1.0	.38	.33	.29	.36	.32	.28	.30	.27
				1.25	.43	.37	.33	.40	.35	.31	.33	.30
				1.5	.46	.41	.36	.43	.38	.34	.35	.33
				2.0	.51	.46	.42	.47	.43	.40	.40	.38
				2.5	.55	.51	.46	.51	.47	.44	.44	.42
				3.0	.58	.54	.50	.54	.50	.47	.46	.44
				4.0	.62	.58	.55	.57	.54	.51	.50	.48
				5.0	.65	.61	.57	.60	.56	.53	.52	.50
11 SEMI-ENCLOSING Metal Reflector 90° to 180°—20% 0° to 90°—56%				0.6	.22	.17	.13	.21	.16	.13	.15	.13
				0.8	.28	.22	.19	.26	.21	.18	.21	.18
				1.0	.31	.26	.23	.30	.25	.22	.24	.21
				1.25	.35	.30	.26	.32	.28	.25	.27	.24
				1.5	.38	.33	.28	.36	.31	.27	.30	.26
				2.0	.43	.38	.33	.40	.36	.32	.34	.30
				2.5	.46	.41	.37	.44	.39	.36	.37	.34
				3.0	.49	.44	.40	.46	.42	.38	.40	.37
				4.0	.54	.49	.44	.50	.45	.42	.43	.40
				5.0	.56	.51	.47	.52	.47	.45	.44	.43
12 TWO-PIECE GLASS Reflector and Bowl 90° to 180°—12% 0° to 90°—53%				0.6	.22	.17	.14	.21	.17	.14	.16	.14
				0.8	.27	.23	.20	.26	.22	.19	.22	.19
				1.0	.30	.26	.23	.29	.26	.23	.25	.22
				1.25	.33	.29	.26	.32	.28	.26	.29	.25
				1.5	.36	.32	.29	.35	.31	.28	.31	.27
				2.0	.41	.37	.33	.39	.35	.32	.34	.31
				2.5	.44	.40	.36	.42	.38	.35	.37	.35
				3.0	.46	.42	.38	.43	.40	.37	.39	.37
				4.0	.49	.45	.42	.47	.43	.41	.42	.40
				5.0	.51	.48	.44	.48	.45	.43	.43	.41
13 SEMI-INDIRECT DENSE GLASS OR METAL AND DENSE GLASS 90° to 180°—69% 0° to 90°—6%				0.6	.16	.13	.11	.12	.10	.08	.07	.06
				0.8	.19	.16	.14	.15	.13	.11	.08	.08
				1.0	.22	.19	.17	.17	.15	.13	.10	.09
				1.25	.25	.22	.19	.20	.17	.15	.11	.10
				1.5	.27	.24	.21	.21	.18	.16	.12	.11
				2.0	.31	.28	.25	.24	.21	.19	.14	.13
				2.5	.34	.31	.28	.25	.23	.22	.15	.15
				3.0	.36	.33	.31	.27	.25	.23	.16	.15
				4.0	.40	.37	.34	.29	.28	.26	.18	.17
				5.0	.41	.38	.37	.31	.29	.28	.19	.18
14 DUST-TIGHT SEMI-INDIRECT (PRISMATIC) 90° to 180°—58% 0° to 90°—19%				0.6	.17	.13	.11	.14	.11	.09	.08	.07
				0.8	.21	.17	.15	.17	.14	.12	.11	.09
				1.0	.24	.20	.17	.20	.16	.14	.13	.11
				1.25	.28	.24	.20	.23	.19	.17	.14	.13
				1.5	.30	.26	.23	.25	.21	.19	.16	.14
				2.0	.34	.30	.27	.28	.24	.22	.18	.17
				2.5	.37	.33	.30	.30	.27	.24	.21	.19
				3.0	.40	.36	.33	.32	.29	.26	.22	.20
				4.0	.44	.40	.37	.35	.32	.30	.24	.23
				5.0	.46	.42	.39	.37	.34	.32	.26	.24
15 DUST-TIGHT SEMI-INDIRECT (CLEAR TOP) 90° to 180°—58% 0° to 90°—16%				0.6	.16	.12	.10	.13	.10	.08	.07	.06
				0.8	.20	.16	.14	.16	.13	.11	.10	.09
				1.0	.23	.19	.17	.18	.15	.13	.12	.10
				1.25	.26	.22	.19	.21	.18	.16	.13	.12
				1.5	.29	.25	.22	.23	.20	.18	.15	.13
				2.0	.32	.29	.26	.26	.23	.20	.17	.15
				2.5	.35	.32	.29	.28	.25	.23	.19	.17
				3.0	.38	.34	.31	.30	.27	.25	.20	.19
				4.0	.41	.38	.35	.33	.30	.28	.22	.21
				5.0	.43	.40	.38	.35	.32	.30	.24	.22
16 MIRRORED INDIRECT 90° to 180°—80% 0° to 90°—0%				0.6	.15	.12	.10	.11	.09	.07	.05	.04
				0.8	.18	.15	.13	.13	.11	.09	.07	.06
				1.0	.22	.19	.16	.15	.13	.11	.08	.07
				1.25	.25	.22	.19	.18	.15	.13	.09	.08
				1.5	.27	.24	.21	.20	.17	.15	.10	.09
				2.0	.30	.27	.25	.22	.19	.17	.11	.10
				2.5	.34	.31	.28	.24	.22	.20	.13	.12
				3.0	.36	.33	.30	.26	.24	.22	.14	.13
				4.0	.40	.37	.34	.28	.26	.24	.15	.14
				5.0	.42	.39	.37	.30	.28	.26	.17	.15

TABLE 6—COMPUTED ILLUMINATION VALUES

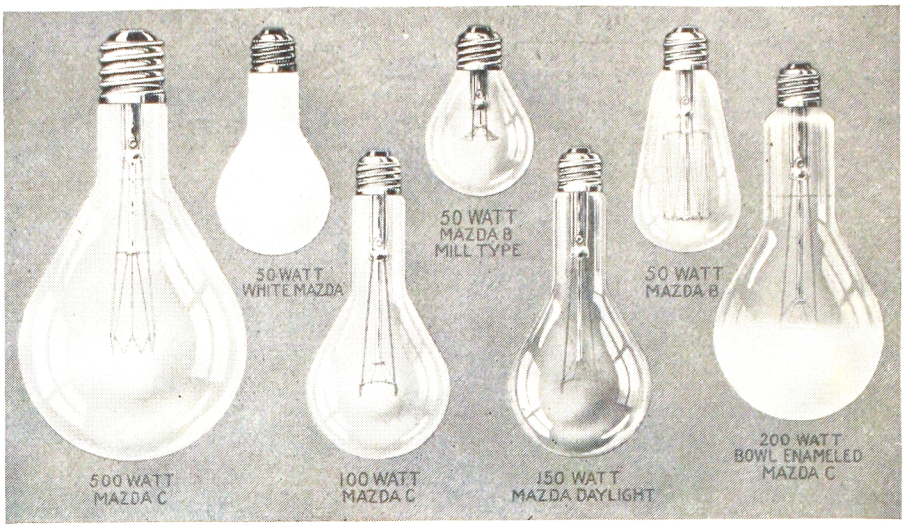
Using Depreciation Factor of 1.4

Area in Square Ft. per Lamp	Size of Lamp		COEFFICIENT OF UTILIZATION															
	Watts	Lumens	.14	.16	.18	.20	.22	.25	.28	.32	.36	.40	.45	.50	.55	.60	.65	.70
			FOOT-CANDLES															
60	100	1350	2.2	2.6	2.9	3.2	3.5	4.0	4.5	5.1	5.8	6.4	7.2	8.0	8.8	9.6	10.4	11.2
	150	2200	3.7	4.2	4.7	5.2	5.8	6.5	7.3	8.4	9.4	10.5	11.8	13.1	14.3	15.7	17.0	18.3
	200	3200	5.4	6.1	6.8	7.6	8.4	9.5	10.8	12.2	13.7	15.2	17.1	19.0	21.0	22.8	24.8	26.6
	300	5100	8.5	9.7	10.9	12.1	13.4	15.2	17.0	19.4	21.8	24.4	27.4	30.4	33.4	36.4	39.4	42.6
70	100	1350	1.9	2.2	2.5	2.7	3.0	3.4	3.9	4.4	5.0	5.5	6.2	6.9	7.6	8.3	8.9	9.6
	150	2200	3.1	3.6	4.0	4.5	4.9	5.6	6.3	7.2	8.1	9.0	10.1	11.2	12.4	13.4	14.6	15.9
	200	3200	4.6	5.2	5.9	6.5	7.2	8.2	9.1	10.4	11.8	13.0	14.7	16.3	18.0	19.6	21.2	22.8
	300	5100	7.3	8.3	9.4	10.4	11.5	13.0	14.8	16.9	18.7	20.8	23.4	26.0	28.6	31.2	33.8	36.4
80	100	1350	1.7	1.9	2.2	2.4	2.7	3.0	3.4	3.8	4.3	4.8	5.4	6.0	6.6	7.2	7.8	8.4
	150	2200	2.7	3.1	3.5	3.9	4.3	4.9	5.5	6.3	7.1	7.9	8.8	9.8	10.8	11.8	12.8	13.7
	200	3200	4.0	4.6	5.1	5.7	6.3	7.1	8.0	9.1	10.3	11.4	12.8	14.3	15.7	17.1	18.6	20.0
	300	5100	6.4	7.3	8.2	9.1	10.0	11.4	12.8	14.5	16.4	18.2	20.5	22.8	25.0	27.3	29.6	31.9
90	100	1350	1.5	1.7	1.9	2.1	2.4	2.7	3.0	3.4	3.9	4.3	4.8	5.4	5.9	6.4	7.0	7.5
	150	2200	2.4	2.8	3.1	3.5	3.8	4.4	4.9	5.6	6.3	7.0	7.9	8.7	9.6	10.5	11.3	12.2
	200	3200	3.6	4.1	4.6	5.1	5.6	6.3	7.1	8.1	9.1	10.1	11.4	12.7	14.0	15.2	16.5	17.8
	300	5100	5.7	6.5	7.3	8.1	8.9	10.1	11.3	12.9	14.6	16.2	18.2	20.2	22.2	24.2	26.3	28.4
100	100	1350	1.4	1.5	1.7	1.9	2.1	2.4	2.7	3.1	3.5	3.9	4.3	4.8	5.3	5.8	6.3	6.7
	150	2200	2.2	2.5	2.8	3.1	3.5	3.9	4.4	5.0	5.7	6.3	7.1	7.9	8.6	9.4	10.2	11.0
	200	3200	3.2	3.7	4.1	4.6	5.0	5.7	6.4	7.3	8.2	9.1	10.3	11.4	12.6	13.7	14.8	16.0
	300	5100	5.1	5.8	6.6	7.3	8.0	9.1	10.2	11.6	13.1	14.6	16.4	18.2	20.0	21.8	23.6	25.5
110	100	1350	1.2	1.4	1.6	1.7	1.9	2.2	2.5	2.8	3.2	3.5	3.9	4.4	4.8	5.3	5.7	6.1
	150	2200	2.0	2.3	2.6	2.9	3.1	3.6	4.0	4.6	5.1	5.7	6.4	7.1	7.9	8.6	9.3	11.0
	200	3200	2.9	3.3	3.7	4.2	4.6	5.2	5.8	6.6	7.5	8.2	9.3	10.4	11.4	12.4	13.5	14.5
	300	5100	4.6	5.3	6.0	6.6	7.3	8.2	9.3	10.6	11.9	13.3	14.9	16.6	18.2	19.8	21.5	23.2
120	100	1350	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.6	4.0	4.4	4.8	5.2	5.6
	150	2200	1.8	2.1	2.4	2.6	2.9	3.3	3.7	4.2	4.7	5.2	5.9	6.5	7.2	7.8	8.5	9.2
	200	3200	2.7	3.1	3.4	3.8	4.2	4.8	5.3	6.1	6.9	7.6	8.6	9.5	10.5	11.4	12.4	13.3
	300	5100	4.2	4.9	5.5	6.1	6.7	7.6	8.5	9.7	10.9	12.1	13.6	15.2	16.7	18.2	19.7	21.2
130	100	1350	1.0	1.2	1.3	1.5	1.6	1.8	2.1	2.4	2.7	3.0	3.3	3.7	4.1	4.5	4.8	5.2
	150	2200	1.7	1.9	2.2	2.4	2.7	3.0	3.4	3.9	4.4	4.8	5.4	6.0	6.6	7.2	7.8	8.5
	200	3200	2.5	2.8	3.2	3.5	3.9	4.4	4.9	5.6	6.3	7.0	7.9	8.7	9.7	10.5	11.4	12.3
	300	5100	3.9	4.5	5.0	5.6	6.2	7.0	7.8	8.9	10.1	11.2	12.6	14.0	15.4	16.8	18.2	19.6
140	100	1350	1.0	1.1	1.2	1.4	1.5	1.7	1.9	2.2	2.5	2.8	3.1	3.4	3.8	4.1	4.5	4.8
	150	2200	1.6	1.8	2.0	2.2	2.5	2.8	3.1	3.6	4.0	4.5	5.0	5.6	6.2	6.7	7.3	7.8
	200	3200	2.3	2.6	2.9	3.3	3.6	4.0	4.6	5.2	5.9	6.5	7.3	8.2	9.0	9.7	10.6	11.4
	300	5100	3.6	4.2	4.7	5.2	5.7	6.5	7.3	8.3	9.4	10.4	11.7	13.0	14.3	15.6	16.9	18.2
150	100	1350	0.9	1.0	1.2	1.3	1.4	1.6	1.8	2.1	2.3	2.6	2.9	3.2	3.5	3.9	4.2	4.5
	150	2200	1.5	1.7	1.9	2.1	2.3	2.6	2.9	3.3	3.8	4.2	4.7	5.2	5.8	6.3	6.8	7.3
	200	3200	2.1	2.3	2.7	3.0	3.3	3.8	4.3	4.9	5.5	6.1	6.9	7.6	8.4	9.1	9.9	10.7
	300	5100	3.4	3.9	4.4	4.9	5.3	6.1	6.8	7.7	8.7	9.7	10.9	12.1	13.3	14.6	15.8	17.0
160	150	2200	1.4	1.6	1.8	2.0	2.2	2.4	2.7	3.1	3.5	3.9	4.4	4.9	5.4	5.9	6.4	6.9
	200	3200	2.0	2.3	2.6	2.9	3.1	3.6	4.0	4.6	5.1	5.7	6.4	7.1	7.9	8.6	9.3	10.0
	300	5100	3.2	3.6	4.1	4.5	5.0	5.7	6.4	7.3	8.2	9.1	10.2	11.4	12.5	13.6	14.8	15.9
	500	9400	5.9	6.7	7.6	8.4	9.2	10.5	11.7	13.4	15.1	16.8	18.9	21.0	23.0	25.2	27.3	29.4
170	150	2200	1.3	1.5	1.7	1.8	2.0	2.3	2.6	3.0	3.3	3.7	4.2	4.6	5.1	5.5	6.0	6.5
	200	3200	1.9	2.2	2.4	2.7	3.0	3.4	3.8	4.3	4.8	5.4	6.0	6.7	7.4	8.1	8.7	9.4
	300	5100	3.0	3.4	3.9	4.3	4.7	5.3	6.0	6.8	7.7	8.6	9.6	10.7	11.8	12.8	13.9	15.0
	500	9400	5.5	6.3	7.1	7.9	8.7	9.9	11.0	12.6	14.2	15.8	17.8	19.7	21.7	23.7	25.6	27.6
180	150	2200	1.2	1.4	1.6	1.7	1.9	2.2	2.4	2.8	3.1	3.5	3.9	4.4	4.8	5.2	5.7	6.1
	200	3200	1.8	2.0	2.3	2.5	2.8	3.2	3.6	4.1	4.6	5.1	5.7	6.3	7.0	7.6	8.2	8.9
	300	5100	2.8	3.2	3.6	4.0	4.5	5.0	5.7	6.5	7.3	8.1	9.1	10.1	11.1	12.1	13.1	14.2
	500	9400	5.2	6.0	6.7	7.5	8.2	9.3	10.4	11.9	13.4	14.9	16.8	18.6	20.5	22.4	24.2	26.1
190	150	2200	1.2	1.3	1.5	1.7	1.8	2.1	2.3	2.6	3.0	3.3	3.7	4.1	4.5	5.0	5.4	5.8
	200	3200	1.7	1.9	2.2	2.4	2.7	3.0	3.4	3.8	4.3	4.8	5.4	6.0	6.6	7.2	7.8	8.4
	300	5100	2.7	3.1	3.5	3.8	4.2	4.8	5.4	6.1	6.9	7.7	8.6	9.6	10.5	11.5	12.4	13.4
	500	9400	5.0	5.7	6.4	7.1	7.8	8.8	9.9	11.3	12.7	14.1	15.9	17.6	19.4	21.2	23.0	24.7
200	150	2200	1.1	1.3	1.4	1.6	1.7	2.0	2.2	2.5	2.8	3.1	3.5	3.9	4.3	4.7	5.1	5.5
	200	3200	1.6	1.8	2.1	2.3	2.5	2.9	3.2	3.7	4.1	4.6	5.1	5.7	6.3	6.9	7.4	8.0
	300	5100	2.5	2.9	3.3	3.6	4.0	4.5	5.1	5.8	6.6	7.3	8.2	9.1	10.0	10.9	11.8	12.7
	500	9400	4.7	5.4	6.0	6.7	7.4	8.4	9.4	10.7	12.1	13.4	15.1	16.8	18.5	20.1	21.8	23.5
220	150	2200	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.6	3.9	4.3	4.6	5.0
	200	3200	1.5	1.7	1.9	2.1	2.3	2.6	2.9	3.3	3.7	4.1	4.7	5.2	5.7	6.2	6.7	7.3
	300	5100	2.3	2.6	3.0	3.3	3.6	4.1	4.6	5.3	6.0	6.6	7.5	8.3	9.1	9.9	10.7	11.6
	500	9400	4.3	4.9	5.5	6.1	6.7	7.6	8.5	9.8	11.0	12.2	13.7	15.3	16.8	18.3	19.8	21.4
240	200	3200	1.3	1.5	1.7	1.9	2.1	2.4	2.7	3.0	3.4	3.8	4.3	4.8	5.2	5.7	6.2	6.7
	300	5100	2.1	2.4	2.7	3.0	3.3	3.9	4.2	4.8	5.5	6.1	6.8	7.6	8.3	9.1	9.8	10.6
	500	9400	3.9	4.5	5.0	5.6	6.2	7.0	7.8	8.9	10.1	11.2	12.6	14.0	15.4	16.8	18.2	19.6
	750	14500	6.0	6.9	7.8	8.6	9.5	10.8	12.1	13.8	15.5	17.3	19.4	21.6	22.7	25.8	28.0	30.2

TABLE 6—COMPUTED ILLUMINATION VALUES

Using Depreciation Factor of 1.4

Area in Square Ft. per Lamp	Size of Lamp		COEFFICIENT OF UTILIZATION															
	Watts	Lumens	.14	.16	.18	.20	.22	.25	.28	.32	.36	.40	.45	.50	.55	.60	.65	.70
			FOOT-CANDLES															
260	200	3200	1.2	1.4	1.6	1.8	1.9	2.2	2.5	2.8	3.2	3.5	4.0	4.4	4.8	5.3	5.7	6.2
	300	5100	2.0	2.2	2.5	2.8	3.1	3.5	3.9	4.4	5.0	5.6	6.3	7.0	7.8	8.4	9.1	9.8
	500	9400	3.6	4.1	4.7	5.2	5.7	6.5	7.2	8.3	9.3	10.3	11.6	12.9	14.2	15.5	16.8	18.1
	750	14500	5.6	6.4	7.2	8.0	8.8	10.0	11.2	12.7	14.3	15.9	17.9	19.9	21.9	23.9	25 9	27.9
280	200	3200	1.1	1.3	1.5	1.6	1.8	2.0	2.3	2.6	2.9	3.3	3.7	4.1	4.5	4.9	5.3	5.7
	300	5100	1.8	2.1	2.3	2.6	2.9	3.3	3.6	4.2	4.7	5.2	5.9	6.5	7.2	7.8	8.4	9.1
	500	9400	3.4	3.8	4.3	4.8	5.3	6.0	6.7	7.7	8.6	9.6	10.8	12.0	13.2	14.4	15.6	16.8
	750	14500	5.2	5.9	6.7	7.4	8.1	9.3	10.4	11.8	13.3	14.8	16.7	18.5	20.4	22.2	24.0	25.9
320	200	3200	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.6	3.9	4.3	4.6	5.0
	300	5100	1.6	1.8	2.0	2.3	2.5	2.8	3.2	3.6	4.1	4.6	5.1	5.7	6.3	6.8	7.4	8.0
	500	9400	2.9	3.4	3.8	4.2	4.6	5.2	5.9	6.7	7.6	8.4	9.4	10.5	11.5	12.6	13.6	14.7
	750	14500	4.5	5.2	5.8	6.5	7.1	8.1	9.1	10.4	11.6	13.0	14.6	16.2	17.8	19.4	21.0	22.6
360	200	3200	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4
	300	5100	1.4	1.6	1.8	2.0	2.2	2.5	2.8	3.2	3.6	4.0	4.5	5.1	5.5	6.1	6.6	7.1
	500	9400	2.6	3.0	3.4	3.7	4.1	4.7	5.2	6.0	6.7	7.5	8.4	9.3	10.3	11.2	12.1	13.1
	750	14500	4.0	4.6	5.2	5.8	6.3	7.2	8.1	9.2	10.4	11.5	13.0	14.4	15.8	17.3	18.7	20.2
400	200	3200	0.8	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.1	2.3	2.6	2.9	3.1	3.4	3.7	4.0
	300	5100	1.3	1.5	1.6	1.8	2.0	2.3	2.5	2.9	3.3	3.6	4.1	4.5	5.0	5.5	5.9	6.4
	500	9400	2.3	2.7	3.0	3.3	3.7	4.2	4.7	5.4	6.0	6.7	7.6	8.4	9.2	10.1	10.9	11.7
	750	14500	3.6	4.1	4.7	5.2	5.7	6.5	7.3	8.3	9.3	10.4	11.7	13.0	14.2	15.6	16.8	18.1
450	200	3200	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.5	2.8	3.0	3.3	3.6
	300	5100	1.1	1.3	1.5	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.6	4.0	4.5	4.9	5.3	5.7
	500	9400	2.1	2.4	2.7	3.0	3.3	3.7	4.2	4.8	5.4	6.0	6.7	7.5	8.2	9.0	9.7	10.4
	750	14500	3.2	3.7	4.1	4.6	5.1	5.8	6.5	7.4	8.3	9.2	10.5	11.5	12.7	13.8	15.0	16.1
500	300	5100	1.0	1.2	1.3	1.5	1.6	1.8	2.0	2.3	2.6	2.9	3.3	3.6	4.0	4.4	4.7	5.1
	500	9400	1.9	2.1	2.4	2.7	3.0	3.4	3.9	4.3	4.8	5.4	6.0	6.7	7.4	8.1	8.7	9.4
	750	14500	2.9	3.3	3.7	4.1	4.6	5.2	5.8	6.6	7.4	8.3	9.3	10.4	11.4	12.5	13.5	14.5
	1000	20000	4.0	4.6	5.1	5.7	6.3	7.1	8.0	9.1	10.3	11.4	12.9	14.3	15.7	17.1	18.5	20.0
600	300	5100	0.8	1.0	1.1	1.2	1.3	1.5	1.7	1.9	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.2
	500	9400	1.6	1.8	2.0	2.2	2.5	2.8	3.1	3.6	4.0	4.5	5.0	5.6	6.1	6.7	7.3	7.8
	750	14500	2.4	2.8	3.1	3.5	3.8	4.3	4.8	5.5	6.2	6.9	7.8	8.6	9.5	10.4	11.2	12.1
	1000	20000	3.3	3.8	4.3	4.8	5.2	6.0	6.7	7.6	8.6	9.5	10.7	11.9	13.1	14.3	15.5	16.7
700	300	5100	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.2	2.6	2.9	3.1	3.4	3.6
	500	9400	1.3	1.5	1.7	1.9	2.1	2.4	2.7	3.1	3.5	3.8	4.3	4.8	5.3	5.8	6.2	6.7
	750	14500	2.1	2.4	2.7	3.0	3.3	3.7	4.1	4.7	5.3	5.9	6.7	7.4	8.1	8.9	9.6	11.4
	1000	20000	2.9	3.3	3.7	4.1	4.5	5.1	5.7	6.5	7.3	8.2	9.2	10.2	11.2	12.2	13.2	14.2
800	300	5100	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.6	1.8	2.0	2.3	2.5	2.7	3.0	3.2
	500	9400	1.2	1.3	1.5	1.7	1.8	2.1	2.4	2.7	3.0	3.4	3.8	4.2	4.6	5.0	5.4	5.9
	750	14500	1.8	2.1	2.3	2.6	2.8	3.2	3.6	4.1	4.7	5.2	5.8	6.5	7.1	7.8	8.4	9.1
	1000	20000	2.5	2.9	3.2	3.6	3.9	4.5	5.1	5.7	6.4	7.1	8.0	8.9	9.8	10.8	11.6	12.5
900	300	5100	0.6	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.6	2.8
	500	9400	1.0	1.2	1.3	1.5	1.6	1.9	2.1	2.4	2.7	3.0	3.4	3.7	4.1	4.5	4.8	5.2
	750	14500	1.6	1.8	2.1	2.3	2.5	2.9	3.2	3.7	4.1	4.6	5.2	5.8	6.3	6.9	7.5	8.0
	1000	20000	2.2	2.5	2.8	3.2	3.5	4.0	4.4	5.1	5.7	6.3	7.1	7.9	8.7	9.5	10.3	11.1
1000	300	5100	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.5
	500	9400	0.9	1.1	1.2	1.3	1.5	1.7	1.9	2.1	2.4	2.7	3.0	3.4	3.7	4.0	4.4	4.7
	750	14500	1.4	1.7	1.9	2.1	2.3	2.6	2.9	3.3	3.7	4.1	4.7	5.2	5.7	6.2	6.7	7.2
	1000	20000	2.0	2.3	2.6	2.9	3.1	3.6	4.0	4.6	5.1	5.7	6.4	7.1	7.8	8.6	9.3	10.0
1200	300	5100	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.5	1.7	1.8	2.0	2.1
	500	9400	0.8	0.9	1.0	1.1	1.2	1.4	1.6	1.8	2.0	2.2	2.5	2.8	3.1	3.4	3.6	3.9
	750	14500	1.2	1.4	1.6	1.7	1.9	2.2	2.4	2.8	3.1	3.5	3.9	4.3	4.7	5.2	5.6	6.0
	1000	20000	1.7	1.9	2.1	2.4	2.6	3.0	3.3	3.8	4.3	4.8	5.4	5.9	6.5	7.1	7.7	8.3
1400	300	5100	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.6	1.7	1.8
	500	9400	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.5	1.7	1.9	2.2	2.4	2.6	2.9	3.1	3.4
	750	14500	1.0	1.2	1.3	1.5	1.6	1.8	2.1	2.4	2.7	3.0	3.3	3.7	4.1	4.4	4.8	5.2
	1000	20000	1.4	1.6	1.8	2.0	2.2	2.5	2.9	3.3	3.7	4.1	4.6	5.1	5.6	6.1	6.6	7.1
1600	300	5100	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6
	500	9400	0.6	0.7	0.8	0.8	0.9	1.0	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9
	750	14500	0.9	1.0	1.2	1.3	1.4	1.6	1.8	2.1	2.3	2.6	2.9	3.2	3.6	3.9	4.2	4.5
	1000	20000	1.2	1.4	1.6	1.8	2.0	2.2	2.5	2.9	3.2	3.6	4.0	4.5	4.9	5.4	5.8	6.2
2000	300	5100	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.3
	500	9400	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.1	1.2	1.3	1.5	1.7	1.8	2.0	2.2	2.4
	750	14500	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.6	2.8	3.1	3.4	3.6
	1000	20000	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.3	2.6	2.9	3.2	3.6	3.9	4.3	4.6	5.0
2500	300	5100	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	0.9	1.0
	500	9400	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.9
	750	14500	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9
	1000	20000	0.8	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.1	2.3	2.6	2.9	3.1	3.4	3.7	4.0



Typical Multiple MAZDA Lamps

TABLE 7—LUMEN OUTPUT OF MULTIPLE MAZDA LAMPS

Subject to change without notice

110-115-120 Volt Standard Lighting Service Clear Lamps		110-115-120 Volt Standard Lighting Service MAZDA Daylight Lamps		220-230-240-250 Volt Service Clear Lamps	
Size of Lamp in Watts	Lumen Output	Size of Lamp in Watts	Lumen Output	Size of Lamp in Watts	Lumen Output
50	500	....	.....	50	440
75	900	75	600	....	.....
100	1350	100	900	100	1060
150	2200	150	1460	....	.....
200	3200	200	2100	200	2600
300	5100	300	3500	300	4300
500	9400	500	6400	500	8000
750	14400	....	.....	750	12800
1000	20000	....	.....	1000	18000

After the outlets have been properly located and the area in square feet per outlet determined, the following is a method of calculating the size of lamp, or rather the lumens required per outlet to produce the desired foot-candles:

$$\text{Lamp Lumens required per Outlet} = \frac{\text{Foot-candles} \times \text{Depreciation Factor} \times \text{Area per Outlet}}{\text{Coefficient of Utilization}}$$

Referring to Table 7 in which the lumen output of lamps is given, the lamp size of the proper type can be selected, which will give most nearly the number of lumens required per outlet.

The formula given on page 17 is used in calculating the foot-candles which will be obtained for any given size of lamp; the above formula is merely transposed to indicate the lamp size for any given foot-candle illumination.

BULLETINS OF THE NATIONAL LAMP WORKS

The purpose of the series of bulletins published by the National Lamp Works of General Electric Co. is to supply authoritative information on artificial lighting. A number of typical bulletins selected from the series are listed below.

7C—Fundamentals of Illumination Design
This bulletin presents the principles of light—its measurement, its control and distribution—together with essentials of illumination design.—44 pages.

41B—Illumination Design Data
This bulletin presents a simple method of illumination design adapted to general lighting systems where standard equipment is to be used. Charts and tables simplify the work and make for accuracy in the design.—24 pages.

42A—Factory Lighting Designs
Ready-made illumination designs for the more common bay sizes found in industrial interiors are presented in this bulletin.—48 pages.

45A—Lighting Designs for Stores
Presents lighting recipes for a number of typical store interiors both large and small, together with designs and notes on lighting of the display windows.—48 pages.

46—Street Lighting and Public Safety
This bulletin presents significant data on the relation of street lighting to traffic accidents and crime, with a discussion of effective street illumination systems for business, residence and outlying districts.—22 pages.

47—Better Electric Lighting in the Home
A practical guide for lighting the home, replete with sketches illustrating the use of various types of lighting fixtures to obtain desirable lighting effects in the different rooms.—32 pages.

48—Stop and Direction Signals for Motor Vehicles
A practical discussion of the problems involved in electrically lighted motor vehicle signal systems.—20 pages.

49—Lighting the Motor Bus
This bulletin discusses the lighting of the bus interior, the electrical circuits, and various exterior lighting units—headlights, tail-lights, signals, markers, etc.—24 pages.

50—Electrical Advertising—Its Forms, Characteristics and Designs
This bulletin contains a discussion of the requirements, characteristics, and adaptabilities of the principal forms of electrical advertising, simple approximate rules to guide the sign user and builder, and many new ideas in picture and story for those interested in this most rapidly growing publicity media.—40 pages.

51—Night Lighting for Outdoor Sports
This bulletin discusses the various types of equipment and gives comprehensive lighting plans for tennis, volley ball, race tracks, bathing beaches, and a number of other common outdoor recreations.—24 pages.

In addition to the bulletins listed above, publications are available on various subjects such as motion picture projection, lamp temperatures, automobile headlighting, school lighting and other subjects of general interest to the lighting industry.

Those requesting bulletins are asked to state the subjects in which they are interested.

THE SALES ORGANIZATION OF THE NATIONAL LAMP WORKS OF GENERAL ELECTRIC CO. IS AS FOLLOWS:

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